

# Draft

## A PHOTOGRAPHIC KEY TO THE BAETIDAE OF EPA REGION THREE



### Introduction

As the use of biological monitoring becomes more prevalent, biological monitoring data are being collected by a variety of state, federal, tribal and local governments as well as watershed groups, conservation districts, and volunteer organizations. To ensure that the maximum benefits are realized from these data, it is important to maintain consistency in the collection, identification, analysis, and reporting of biological data. One difficulty in using benthic macroinvertebrates as indicators of stream water quality has been that some taxonomic groups have undergone frequent and extensive systematic revision, making data consistency problematic. One of the groups commonly encountered that has recently undergone revision is the mayfly family Baetidae. The purpose of this document is to help improve accuracy and consistency of taxonomist identifications in EPA Region 3 by providing the most recent information available and by clarifying difficult couplings with photographs.

The following key is designed to be used in the mid-Atlantic region, covering the states of Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia. Several taxa not documented from Region 3 but occurring in adjacent regions have been included. Genera covered in this key include: *Acentrella*, *Acerpenna*, *Apobaetis*, *Baetis*, *Barbaetis*, *Callibaetis*, *Centroptilum*, *Cloeon*, *Dipheter*, *Heterocloeon*, *Paracloeodes*, *Procloeon*, *Pseudocentroptiloides*, and *Pseudocloeon*. The key to genera of the family Baetidae is based on keys in Merritt and Cummins (1996) and Lugo-Ortiz and McCafferty (1998). Distributional data is based on Randolph (2002).

#### Suggested citation:

Pfeiffer, J., E. Kosnicki, M. Bilger, and B. D. Marshall. 2006. A Photographic Key to the Baetidae of EPA Region Three. Prepared by EcoAnalysts, Inc. for the United States Environmental Protection Agency, Office of Environmental Information, Environmental Analysis Division, Washington, DC.

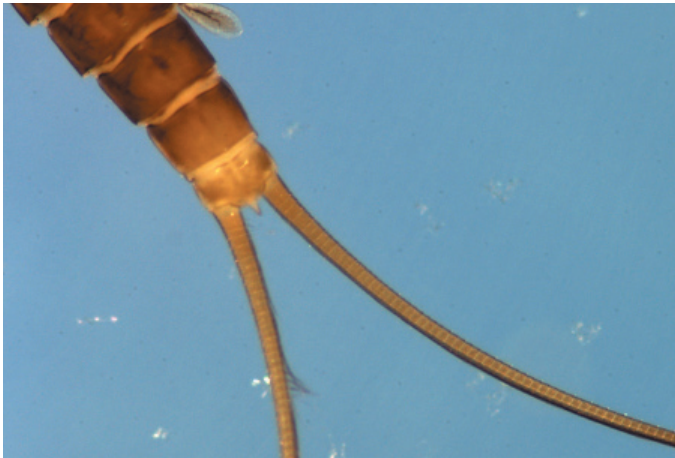
This document was funded by USEPA under US Department of Commerce, Commerce Information Technology Solutions Contract No. 50-CMAA-900065 with Perot Systems Government Services

**The following references were used in the construction of this key:**

- Edmunds, G F, Jr. and R D Waltz. 1996. Ephemeroptera. *in* An Introduction to the Aquatic Insects of North America, Third Edition. Merritt, R W and K W Cummins, eds. Kendall /Hunt Publishing, Dubuque, Iowa. 862 pp.
- Jacobus, L M, W P McCafferty. 2006. A new species of *Acentrella* Bengtsson (Ephemeroptera:Baetidae) from Great Smoky Mountains National Park, USA. Aquatic Insects, v. 28, p. 101-111.
- Lugo-Ortiz, C R, W P McCafferty. 1998. A new North American genus of Baetidae (Ephemeroptera) and key to *Baetis* complex genera. Entomological News 109(5): 345-353.
- Lugo-Ortiz, C R, W P McCafferty, and R D Waltz. 1999. Definition and reorganization of the genus *Pseudocloeon* (Ephemeroptera:Baetidae) with new species descriptions and combinations. Transactions of the American Entomological Society 125(1-2): 1-37.
- McCafferty, W P, R D Waltz, J M Webb, L M Jacobus. 2005. Revision of *Heterocloeon* McDunnough (Ephemeroptera: Baetidae): Journal of Insect Science, 5:35 [Insectscience.org/5.35](http://Insectscience.org/5.35)
- Morihara, D K, W P McCafferty. 1979. The *Baetis* larvae of North America (Ephemeroptera:Baetidae). Transactions of the American Entomological Society 105, 139-221.
- Randolph, P R. 2002. Atlas and Biogeographic review of the North American Mayflies (Ephemeroptera) . PhD Dissertation, Department of Entomology, Perdue University. 514 pp.
- Wiersema, N A. 2000. A new combination for two North American small minnow mayflies (Ephemeroptera: Baetidae). Entomological News 111(2): 140-142.

# Ephemeroptera: Baetidae

1. Median caudal filament reduced, approximately 1/10 or less length of cerci (Fig. 1).....2
- 1'. Median caudal filament longer, usually 1/2 to sub-equal in length to cerci (Figs. 2 and 3).....
- .4



**Fig. 1.** Median caudal filament reduced (*Heterocloeon* sp.).



**Fig. 2.** Median caudal filament developed (*Baetis* sp.).

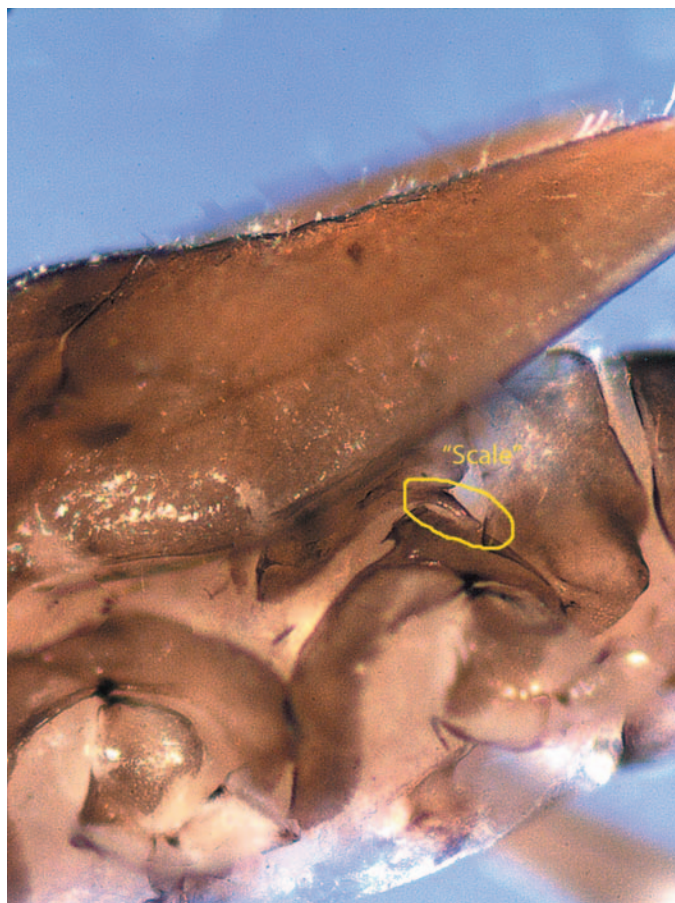


**Fig.3.** Caudal filaments are often damaged, particularly in bioassessment samples. Look for broken filaments. If the broken median filament is approximately the same diameter of lateral filaments, it is likely to have been sub-equal or greater in length to the lateral caudal filaments.

2. (1) Usually with a row of fine setae on dorsal margin of femur, tibia, and tarsus (Fig 4.); Hind wing pads reduced to a small “scale” which is not free of the integument (Fig. 5) ..... *Acentrella*
- 2'. Tibia and tarsus without dorsal row of fine setae, although dorsal setal row often present on femur; hind wing pads absent or reduced, but not as in Figure 5.....3



**Fig. 4.** Hair fringe on the dorsal surface of the femur, tibia and tarsi. The hair fringe is apparent on all legs, but may be worn or broken on older specimens. (*Acentrella* sp.)

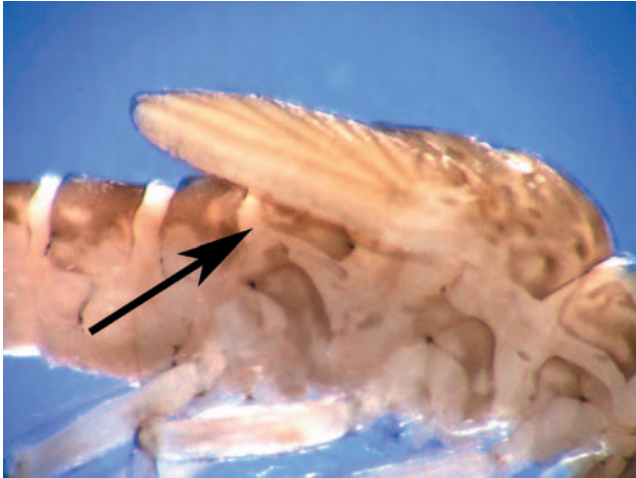


**Fig. 5.** Lateral view of the thorax of *Acentrella* sp. Hind wing pads reduced to a small, downward-pointing “scale”. This can be difficult to discern, particularly in immature specimens.

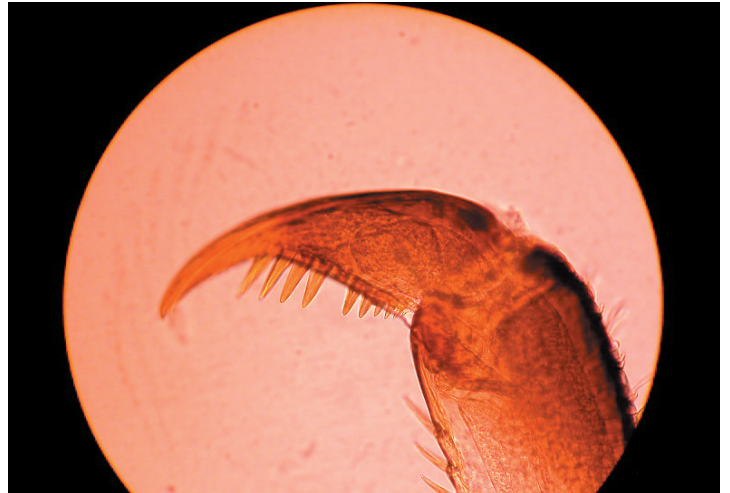


3. (2') Claws with a single row of denticles; hind wing pads absent and lateral posterior margin of metanotum approximating a right angle in lateral view (Fig. 6); procoxal gills never present..... *Plauditus*

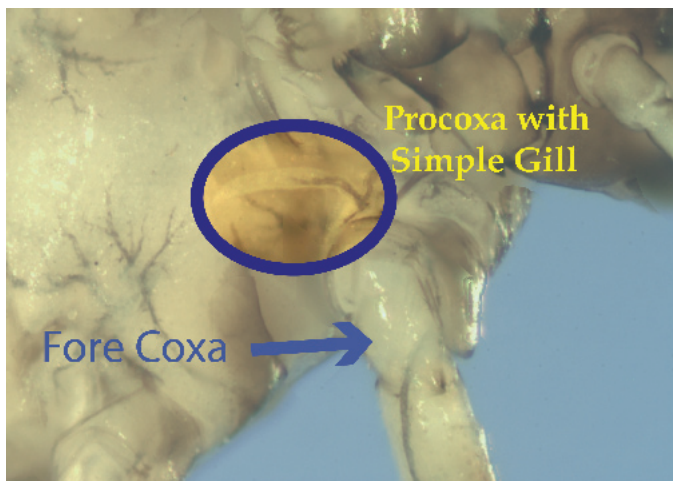
3' Claws with 2 rows of denticles or one row of denticles and a parallel ridge in place of second row (Fig.7. Note that magnification of 400X is usually required to see these characters); some species with simple gills on procoxa (Fig.8); hind wing pads reduced but present (Fig. 9); ..... *Heterocloeon*



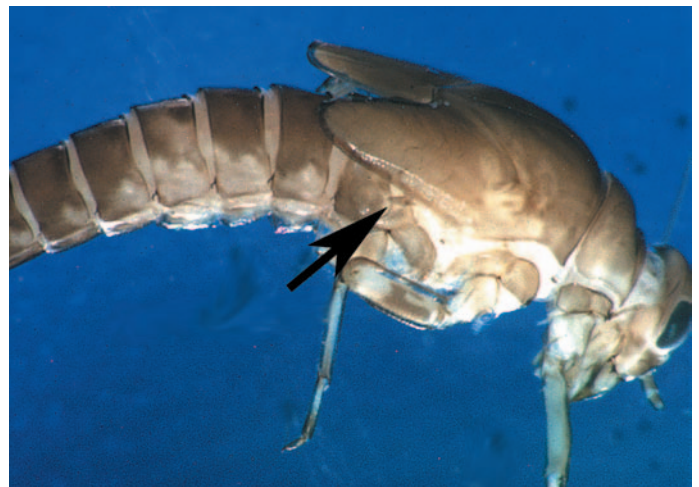
**Fig. 6.** Lateral view of *Plauditus* thorax. Lateral posterior margin of metanotum (arrow) visible under wingpad forming a right angle. Even in late instar larvae such as this, no trace of a hind wing pad is present. Compare to Figs. 5 and 9.



**Fig. 7.** Tarsal claw of *Heterocloeon*. In this species, there is one row of denticles with a ridge in the place of the second row of denticles (400x).

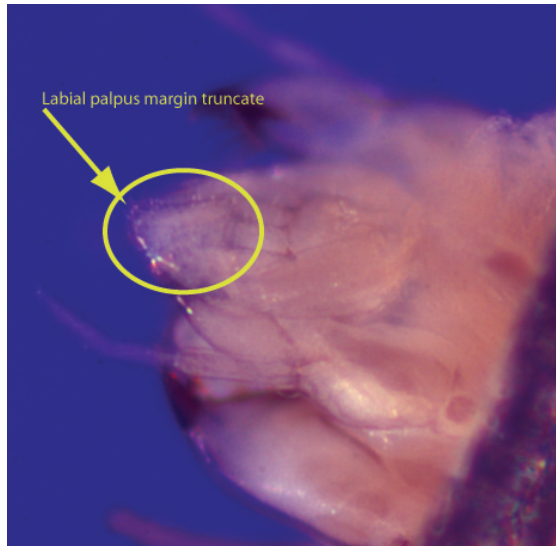


**Fig. 8** Procoxal gills of *Heterocloeon* sp. The simple gill on the procoxa usually sticks out away from the body and can best be seen against a dark background.

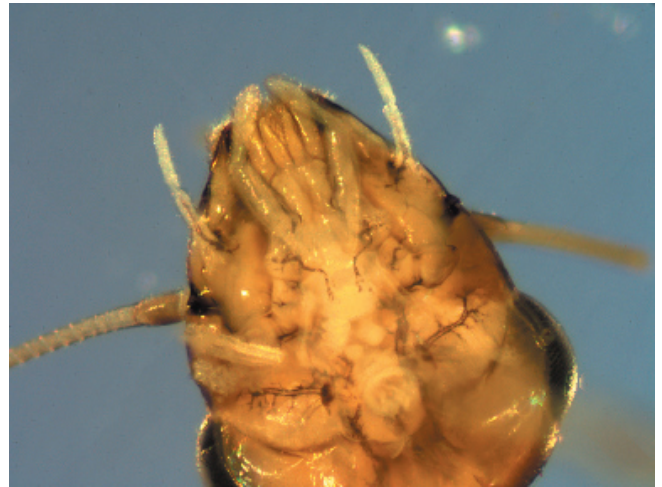


**Fig. 9.** Lateral view of thorax of *Heterocloeon*. Wing pads are reduced but visible (arrow).

4. (1') Apex of labial palps simple and truncate (Fig.10); caudal filaments with distinct banding every 3<sup>rd</sup> or 5<sup>th</sup> segment ..... 5
- 4'. Labial palps variable but never truncate as above (Fig. 11); caudal filaments not banded every 3<sup>rd</sup> or 5<sup>th</sup> segment ..... 7

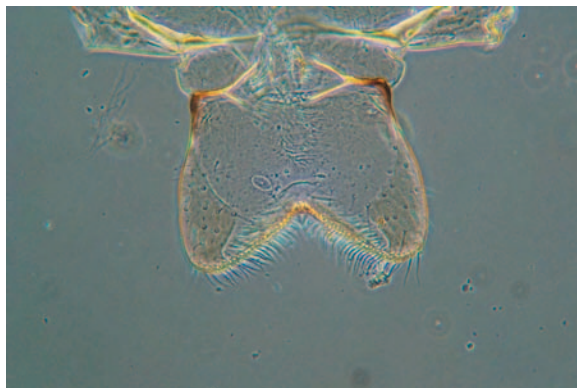


**Fig.10.** Labial palps truncate, ventral view. (*Centroptilum* sp.)

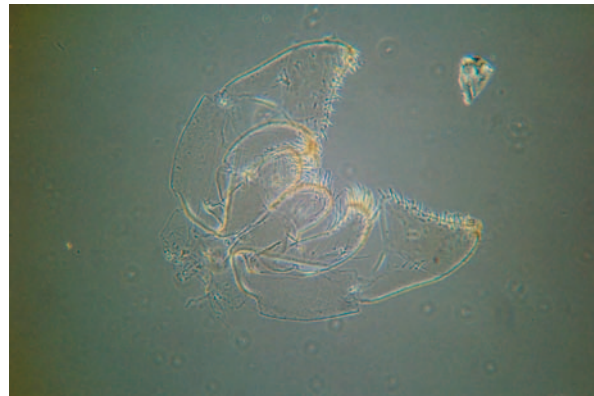


**Fig. 11.** Labial palps more elongate, sometimes resembling mittens. (*Heterocloeon* sp.)

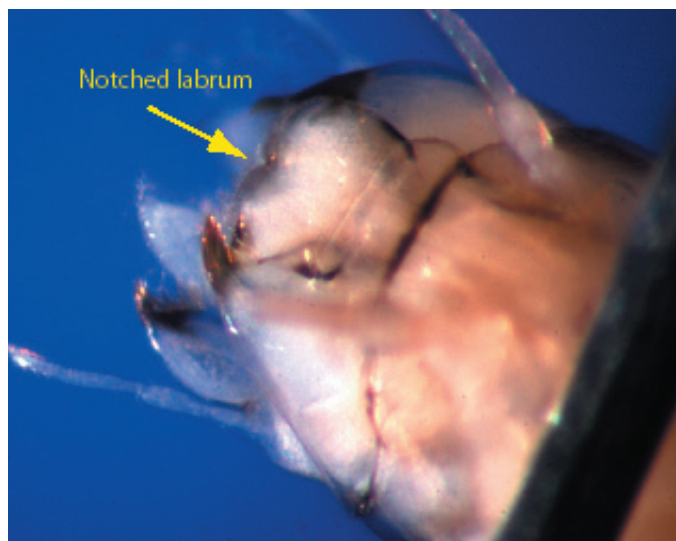
5. (4) Labrum w/ deep triangular median notch on anterior margin (Fig. 12); Labial palps broadly truncate and paraglossae broad and longer than glossae (Fig 13); claws longer than respective tarsi; gills simple (not known from states included in this key, but found in adjacent states (OH)).....*Pseudocentroptiloides*
- 5'. Labrum with smaller, squared median notch along anterior margin (Fig.14); paraglossae sub-equal to glossae (Fig.15); claws usually shorter than respective tarsi; gills simple or compound ..... 6



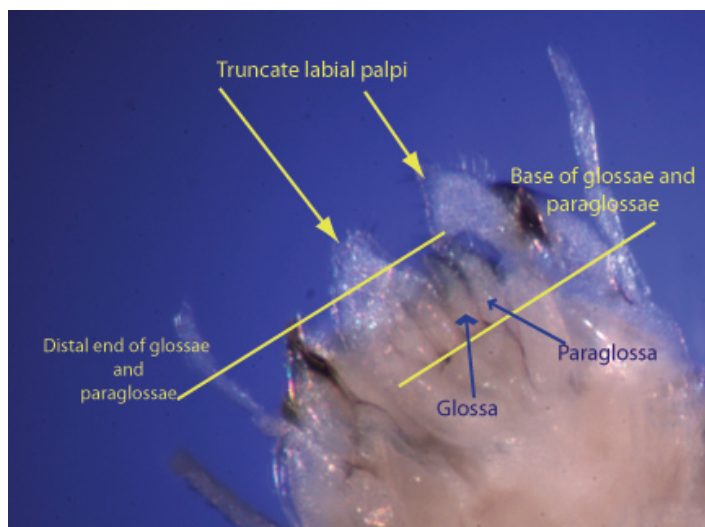
**Fig. 12.** Labrum with deep notch (*Pseudocentroptiloides* sp.)  
(Photo S.K. Burian)



**Fig. 13.** Labial palps and labium of *Pseudocentroptiloides* sp.  
(Photo S.K. Burian)



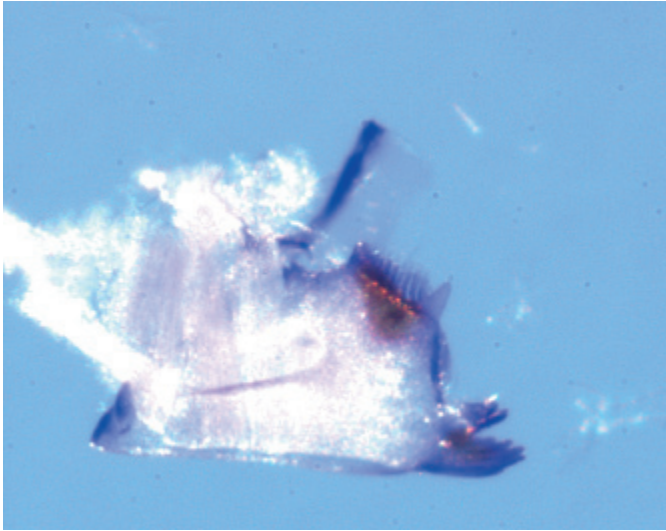
**Fig. 14.** Notched labrum. The "smaller" notch is clearly visible using a dissecting scope. (*Centroptilum* sp.)



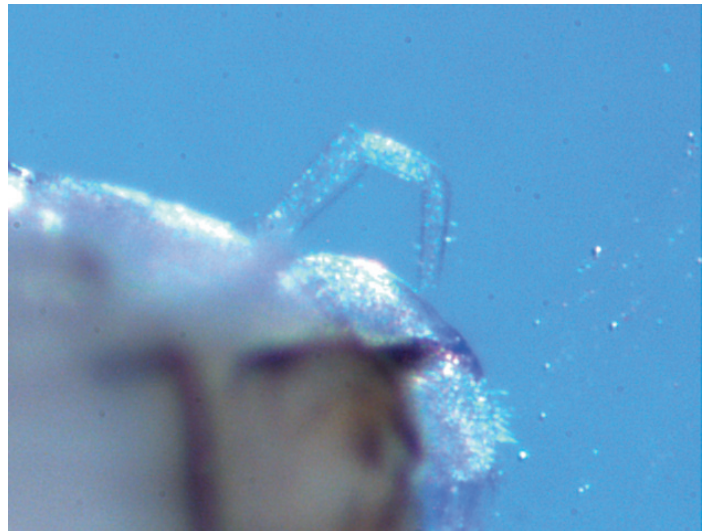
**Fig. 15.** The glossae and paraglossae are often hidden behind the labial palps. However, you should be able to discern them without removing the palps. All that is necessary to determine is whether they are about the same length, or the outer structures (paraglossae) are much longer. (*Centroptilum* sp.)



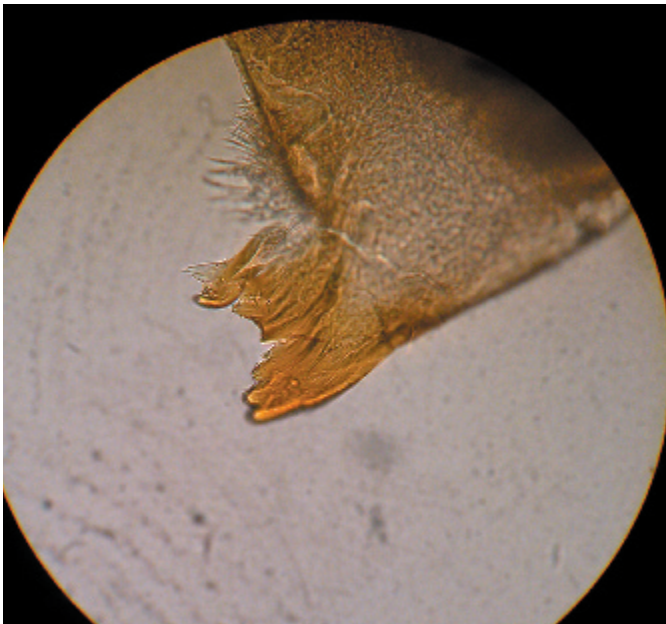
6. (5') Incisor of mandible usually separated to base (Fig. 16); maxillary palps 3-segmented with segment 3 as long or longer than segment 2 (Fig. 17); gills simple; cerci with lateral setae absent in distal fourth; abdomen with lateral spines absent or reduced.....*Centroptilum*
- 6'. Incisor of mandible usually separated less than half the distance to base (Fig. 18); maxillary palps 2 or 3-segmented with segment 3 shorter than segment 2 when present (Fig. 19); gills usually compound; cerci with lateral setae usually present to tip; abdomen with lateral spines well developed on at least segments 8 and 9.....*Procloeon*



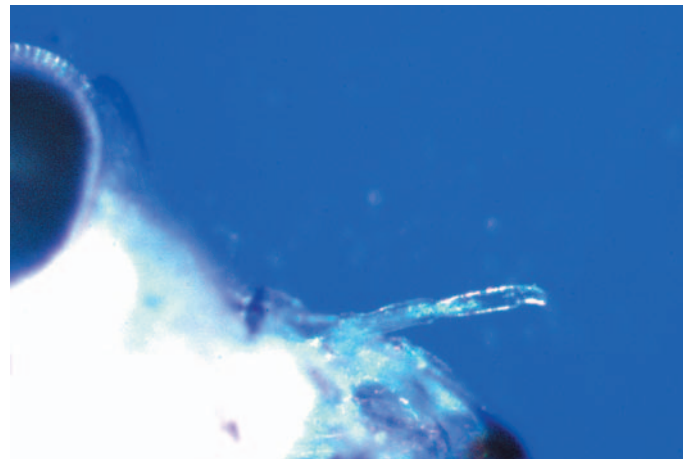
**Fig. 16.** Incisor region of right mandible (lower right) separated nearly to the base. This character can usually be seen by pushing down on the head to spread the mouthparts. (*Centroptilum* sp.)



**Fig. 17.** Maxillary palp of *Centroptilum*. The second and third segments of the maxillary palp are about equal in length.



**Fig. 18.** Incisor regions of mandible separated less than halfway to base. (*Procloeon* sp.)



**Fig. 19.** Maxillary palp of *Procloeon*. The third (apical) segment is much shorter than the second.



7. (4')Compound gills present (Fig. 20) .....(*Cloeon*, *Callibaetis*)..... 8

7'. All gills simple (Fig. 21) ..... 9



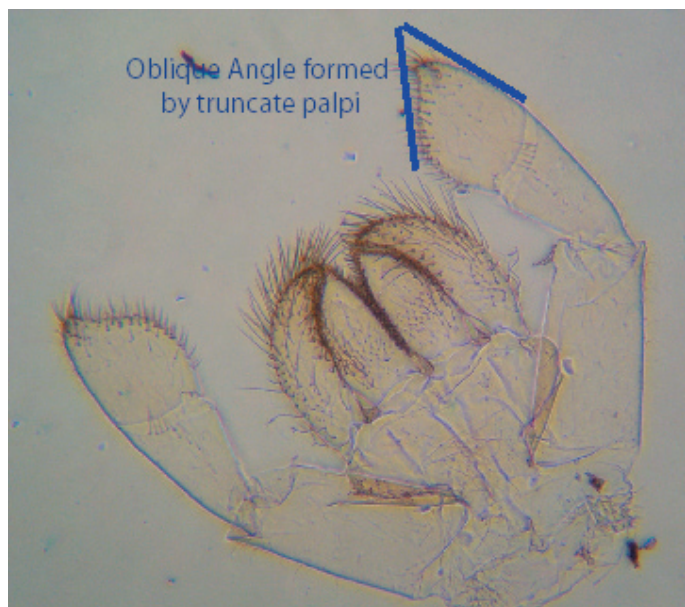
**Fig. 20.** Compound gills present. These often appear as two separate gills arising from the same base near the posterior margin of each abdominal segment. (*Callibaetis* sp.)



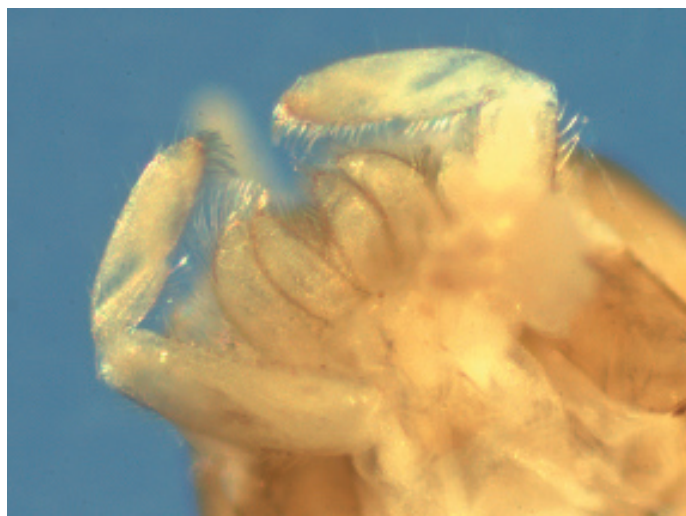
**Fig. 21.** Simple gills. One simple gill arising from the posterior margin of most abdominal segments. (*Baetis* sp.)

8. (7) Labial palps 3-segmented, obliquely truncate (Fig. 22); hind wing pads absent; recurved flaps on gills folded dorsally..... *Cloeon*

8'. Labial palps appearing 2-segmented, long and "spoon-shaped" (Fig. 23); hind wing pads present; recurved flaps on gills folded ventrally.....*Callibaetis*



**Fig. 22.** Oblique angle of labial palps. *Cloeon* is usually found in seasonal wetlands; rare in stream bioassessment samples. (*Cloeon* sp.)  
(Photo S.K. Burian)



**Fig. 23.** Labial palps not truncate and appearing 2-segmented. This taxon is more common in stream bioassessment samples but is also collected from ephemeral habitats. (*Callibaetis* sp.)

9. (7') Claws without denticles and long, equal to or greater than half the length of their respective tarsi (Fig. 24)..... (Apobaetis, Paracloeodes) 10
- 9'. Claws with denticles and shorter, less than half the length of their respective tarsi (Fig. 25) ..... 11



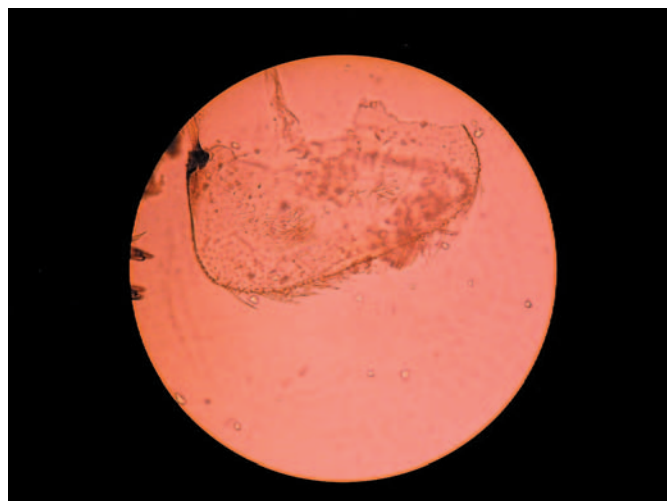
**Fig. 24.** Long tarsal claws lack denticles even at high magnification. (400x, *Apobaetis* sp.)



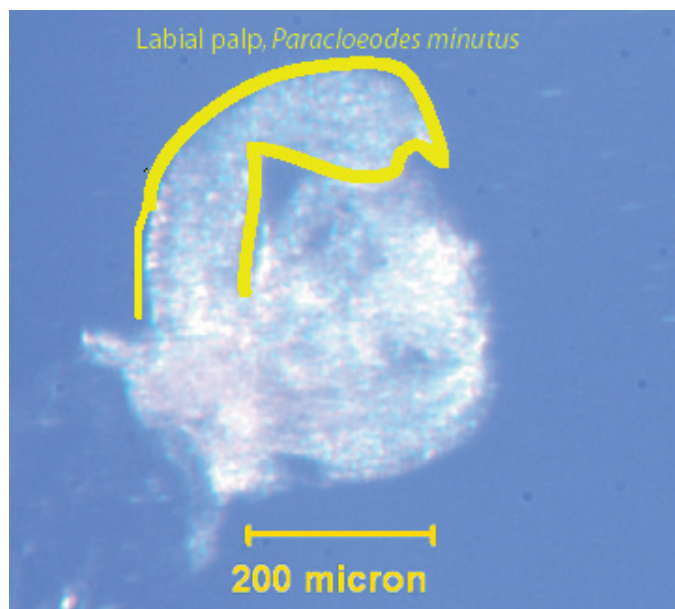
**Fig. 25.** Short tarsal claws. Denticles present. Total length less than 50% of tarsus. (*Baetis* sp.)

10. (9) Claws sub-equal to length of tarsi (Fig. 24); labrum without median notch on anterior margin (Fig. 26) (not recorded from EPA Region 3, but found in adjacent states).....*Apobaetis*

- 10'. Claws about half the length of tarsi; labrum with median notch; labial palps notched as in Fig. 27. (not recorded from EPA Region 3, but found in adjacent states NY, OH).....*Paracloeodes*

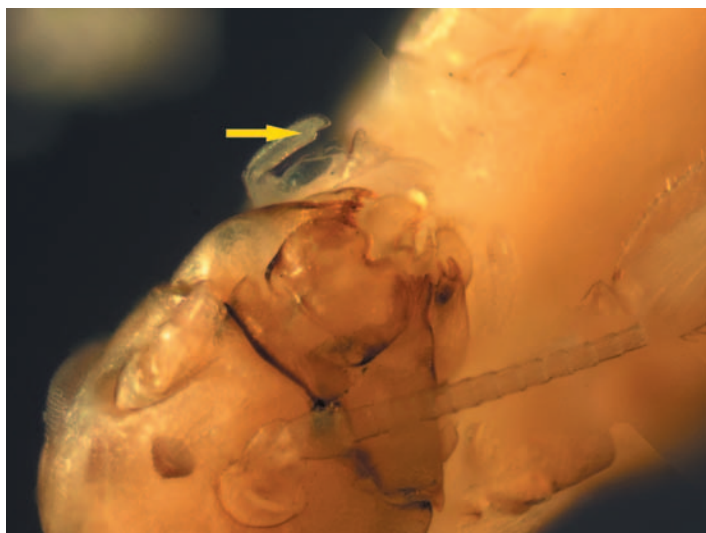


**Fig. 26.** Labrum of *Apobaetis* sp. (400x). Unlike other Baetidae, there is no median notch on the front margin of the labrum.

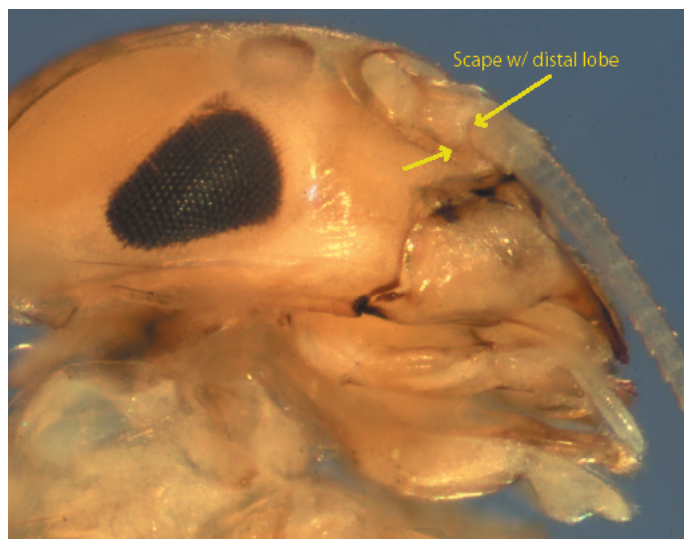


**Fig. 27.** Labial palp. (*Paracloeodes* sp.)

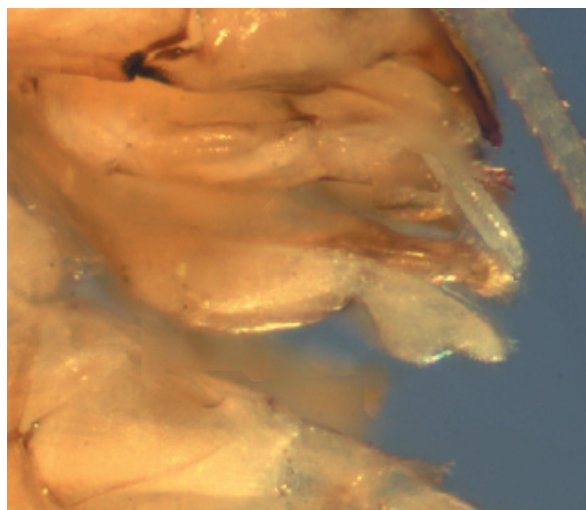
11. (9') Maxillary palps with sub-apical excavation (Fig. 28); antennal scape with distal lobe (Fig. 29; labial palp often with well developed medial process (Fig. 30) .....*Pseudocloeon*
- 11'. Maxillary palps and scape not as above, medial process may or may not be developed .....12



**Fig. 28.** Maxillary palp with excavation prior to apex. (*Pseudocloeon* sp.)



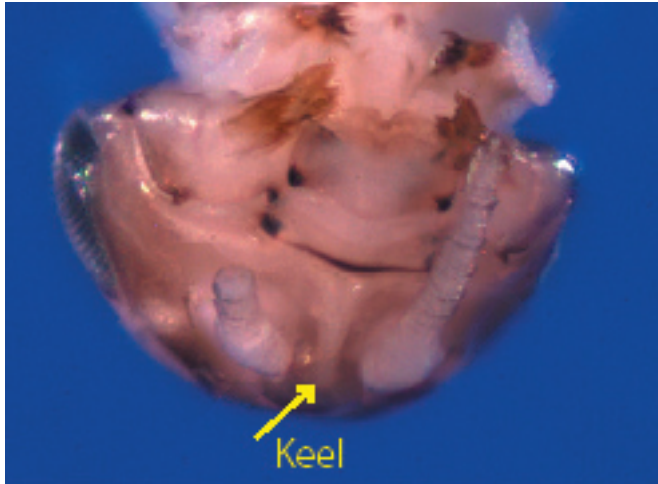
**Fig. 29.** The scape is the first apparent segment of an insect antenna. (*Pseudocloeon* sp.)



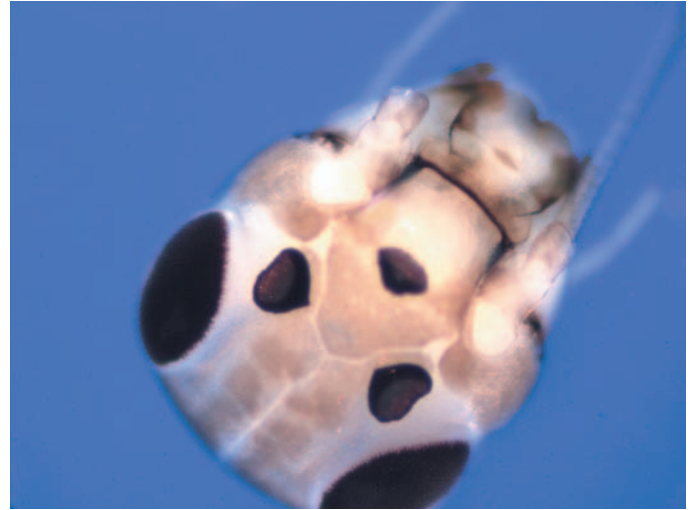
**Fig. 30.** Labial palp with large, developed medial process. (*Pseudocloeon* sp.)



12. (11') Antennae inserted close together forming a raised keel between insertion points (Fig. 31) ..... 13
- 12'. Antennae inserted apart, area between antenna insertions points not raised (Fig. 32) ..... 14



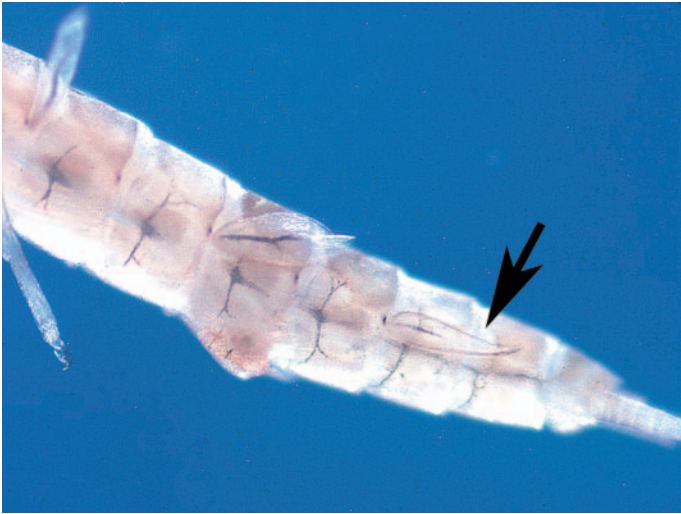
**Fig. 31.** Antennae are inserted close together forming a raised keel between. (*Acerpenna* sp.)



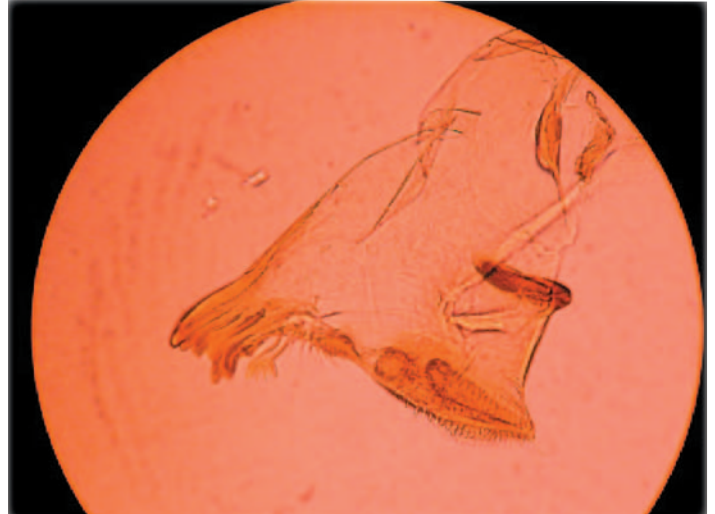
**Fig. 32.** Antennae inserted apart. In these taxa, the area between the antennae (frons) is relatively flat and does not form a keel. (*Baetis* sp.)



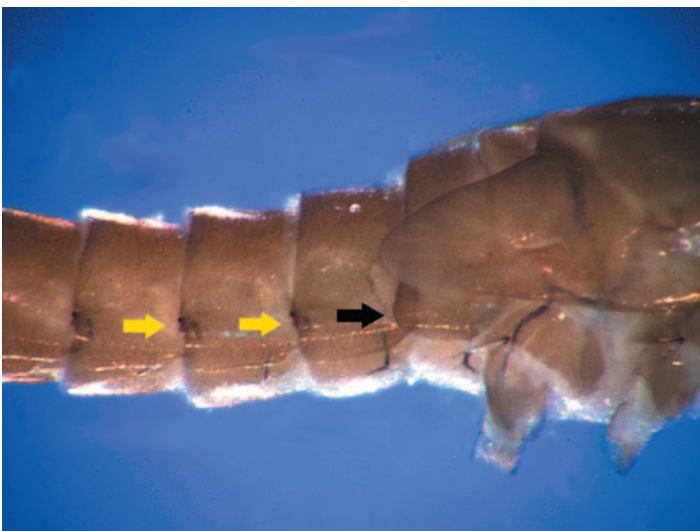
13. (12) Lateral gills present on abdominal segment 1; gill on abdominal segment 7 pointed and narrower than preceding gills (Fig. 33); Labial palp with well developed medial process (similar to Fig 30); tuft of setae on right mandible between incisors and molar (Fig. 34)..... *Acerpenna*
- 13'. Gills absent on abdominal segment 1 (Fig. 35); gill on abdominal segment 7 rounded and similar in shape to gills on preceding segments; prostheca on right mandible reduced; bifid and serrate on inner margin (Fig. 36) ..... *Dipheter hageni*



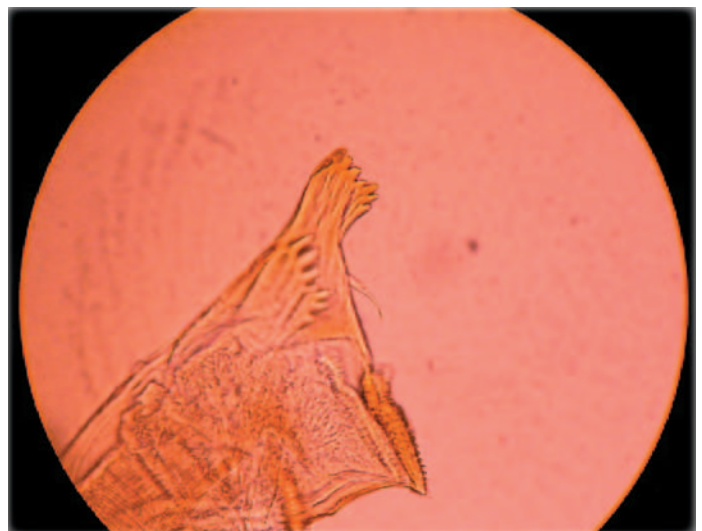
**Fig. 33.** Gills on abdominal segment 7 are longer and narrower (arrow) than those on preceding segments. (*Acerpenna* sp.)



**Fig. 34.** The tuft of setae between the molar region (right bottom) and the incisors (left bottom) is located proximal to the incisors best viewed at 400x. (*Acerpenna* sp.)



**Fig. 35.** Lateral view of *Dipheter hageni*. On the first abdominal segment, no gill or gill scar is present on the posterior lateral margin (black arrow). Even though the gills on following segments may be missing, a darkened gill scar is usually visible (yellow arrows).



**Fig. 36.** The tuft of setae between the molar region (right bottom) and the incisors (top) is located proximal to the incisors (best viewed at 400x). In *Dipheter*, the tuft is reduced to a bifid (forked) hair. This species is often misidentified as *Baetis*. (*Dipheter hageni*)

14. (12') Antennae long, length greater than twice the length of the head capsule; color variable (Fig. 37).....*Baetis*
- 14'. Antennae short, sub-equal in length to head capsule; color pale with dark pigment bands encircling some abdominal segments (in EPA Region 3, known only from southern Virginia)..... *Barbaetis*



**Fig. 37.** *Baetis* sp. larvae have long antennae. This is one of the most commonly collected baetid taxa in North America. (*Baetis tricaudatus*)

# Acentrella sp.

The genus *Acentrella* sp. is a common component of the baetid community in EPA Region 3 streams. The fringe of fine hairs present on the femur, tibia, and tarsus is the easiest character to use in distinguishing this genus. In older specimens this fringe may be worn or broken but is usually still apparent. One species (*Acentrella turbida*) is recorded from the region. A second species (*Acentrella parvulum*), has been recorded from Ohio westward, and may eventually be found in region 3.

## Additional References:

**Jacobus, LM, W P McCafferty, 2006, A new species of Acentrella Bengtsson (Ephemeroptera:Baetidae) from Great Smoky Mountains National Park, USA: Aquatic Insects, v. 28, p. 101-111.**

Provides an updated key to the species of baetids currently assigned to the genus *Acentrella*, plus description of a new species from the southeastern US.

**McCafferty, W P, M J Wigg, R D Waltz. 1994. Systematics and biology of Acentrella turbida (McDunnough) (Ephemeroptera :Baetidae). Pan-Pacific Entomologist 70[4], 301-308.**

Provides figures for *Acentrella turbida*, the most common *Acentrella* species in the region.

**Moriyama, DK, W P McCafferty. 1979. The Baetis Larvae of North America (Ephemeroptera:Baetidae). Transactions of the American Entomological Society 105, 139-221.**

Descriptions and figures of species for *Baetis* sp. and many taxa once included in *Baetis*, including species now placed in the genera *Acentrella*, *Acerpenna*, *Diphetera hageni*, *Plauditus*, and *Psuedocloeon*.

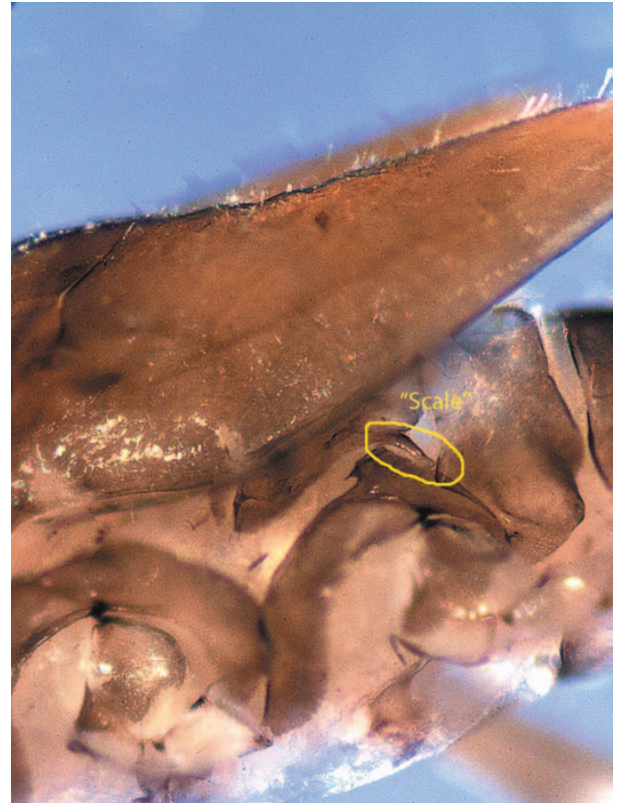
**Wiersema, NA. A new combination for two North American small Minnow Mayflies (Ephemeroptera: Baetidae). Entomological News 111[2], 140-142. 2000.**

Reassigns two species to the genus *Acentrella* (*alachua* and *parvulum*) from the genus *Plauditus*. Provides figures for *Acentrella parvulum*.





*Acentrella turbida* in dorsal view. The body form superficially resembles that of Heptageniidae in many eastern specimens.



Lateral margin of the thorax of a late instar *Acentrella* larva showing the hind wing pad reduced to a small, downward pointing "scale".



Two late instar *Acentrella turbida* larvae.



Dorsal view of *Acentrella parvulum*. This species has not been recorded from EPA Region 3, but has been found in adjacent regions.



# *Plauditus* sp.

The genus *Plauditus* sp. was erected in 1998 encompassing species which were previously placed in the genera *Baetis* sp. and *Barbaetis* sp. (Lugo-Ortiz and McCafferty, 1998). These have a reduced median caudal filament and lack a hind wing pad. They are generally small, rather fragile baetids. *Plauditus* sp. is common in stream bioassessment samples from EPA Region 3.

## Additional References:

**Lugo-Ortiz, CR, W P McCafferty. 1998. A new North American genus of Baetidae (Ephemeroptera) and key to Baetis complex genera. Entomological News 109[5], 345-353.**

Provides characters for the genus *Plauditus* and provides a key to the genera of the *Baetis* complex (*Pseudocloeon*, *Baetis*, *Barbaetis*, *Heterocloeon*, and *Plauditus*).

**Morihara, DK, W P McCafferty. 1979. The Baetis Larvae of North America (Ephemeroptera:Baetidae). Transactions of the American Entomological Society 105, 139-221.**

Descriptions and figures of species for *Baetis* sp. and many species once included in *Baetis*, including species now placed in the genera *Acentrella*, *Acerpenna*, *Diphetor hageni*, *Plauditus*, and *Pseudocloeon*.



*Plauditus* sp. in dorsal view. The wingpads are dark because this specimen was about to emerge when collected. The body is shaped fundamentally different from most *Acentrella* sp.



Another *Plauditus* sp. in dorsal view.

# *Heterocloeon* sp.

The genus *Heterocloeon* sp. was recently revised by McCafferty et al. (2005). Several species formerly included in the genera *Acentrella* sp and *Plauditus* sp. were moved into *Heterocloeon* sp. Therefore, many of the species recently moved into *Heterocloeon* will not key correctly in older keys.

## Additional References:

**McCafferty, WP, R D Waltz, J M Webb, L M Jacobus, 2005, Revision of *Heterocloeon* McDunnough (Ephemeroptera: Baetidae): *Journal of Insect Science*, v. 5.**

Most recent review of the genus *Heterocloeon*. Provides descriptions of the three subgenera and the species currently assigned to the genus

**Morihara, DK, W P McCafferty. 1979. The *Baetis* Larvae of North America (Ephemeroptera:Baetidae). *Transactions of the American Entomological Society* 105, 139-221.**

Descriptions and figures for *Baetis* sp. and many taxa once included in *Baetis*, including species now placed in the genera *Acentrella*, *Acerpenna*, *Dipheter hageni*, *Plauditus*, and *Psuedocloeon*.

**Muller-Liebenau, I. 1974. *Rheobaetis*, a New Genus from Georgia (Ephemeroptera:Baetidae). *Annals of the Entomological Society of America*. 67:555-567.**

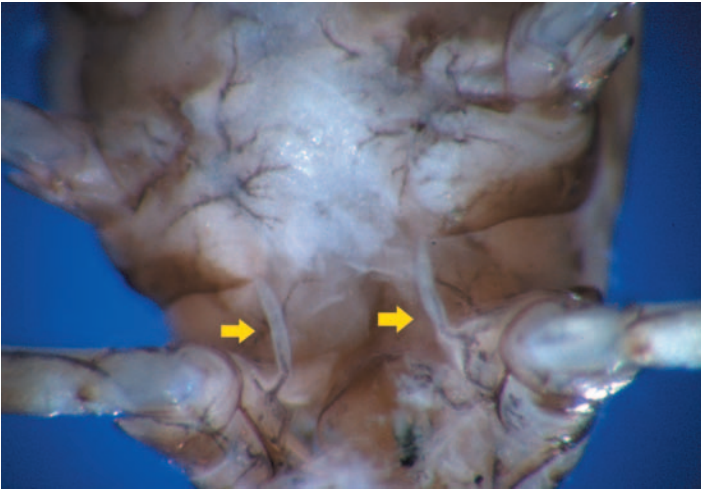
Original description of the genus *Heterocloeon* (as *Rheobaetis*)



Dorsal view of *Heterocloeon* sp.



*Heterocloeon amplum*, one of the species formerly in the genus *Acentrella* sp.



The simplest diagnostic character for *Heterocloeon* sp., when present, is the occurrence of simple gills arising from the base of the procoxae (arrows). This can usually be observed without high magnification. They are more durable than abdominal gills and are usually attached to even severely damaged specimens. However, they can be very difficult to see in rotting or digested specimens.



*Heterocloeon* sp. larvae sometimes have a heavily sclerotized ridge in addition to a row of denticles on the tarsal claw. In this image the ridge occurs in the foreground and the denticles arise behind the ridge in the background. This feature occurs in taxa that may not exhibit procoxal gills.

# *Pseudocentroptiloides* sp.

The genus *Pseudocentroptiloides* sp. has not been recorded from the states comprising EPA Region 3, but occurs in adjacent states.

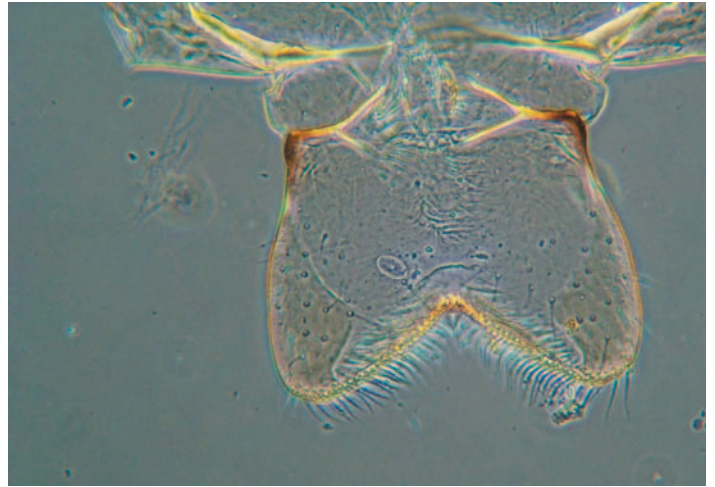
## **Additional References:**

Waltz, RD, W P McCafferty. 1989. New species, redescrptions, and cladistics of the genus *Pseudocentroptiloides* (Ephemeroptera : Baetidae). *Journal of the New York Entomological Society* 97[2], 151-158.

Description of *Pseudocentroptiloides usa*, the species found in the eastern US. Includes figures.



Dorsal view of the abdomen of *Pseudocentroptiloides* sp. (Photo by S.K. Burian)



The deeply cleft labrum of *Pseudocentroptiloides* sp. (Photo by S.K. Burian)



## *Centroptilum* sp. / *Procloeon* sp.

Both *Centroptilum* sp. and *Procloeon* sp. are found throughout EPA Region 3. Both genera have truncate labial palps and tails banded every 3rd to 5th segment.



Dorsal view of *Centroptilum* sp.



Dorsal view of *Procloeon* sp.



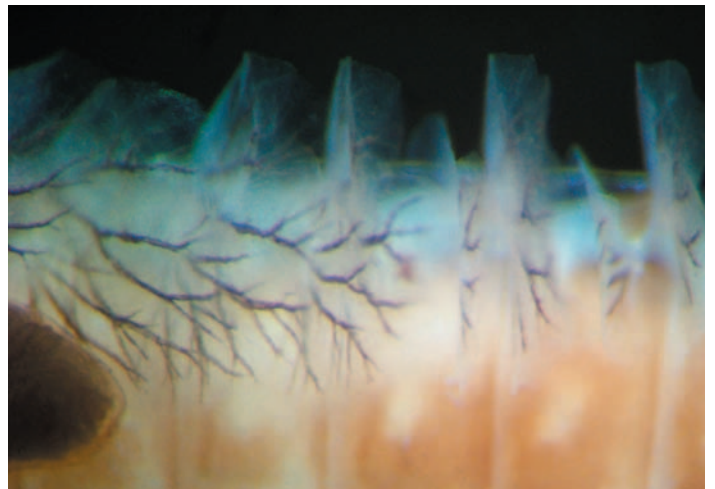
The banding on the caudal filaments of *Centroptilum* sp. and *Procloeon* sp. are often visible even if the majority of the cerci are missing.

# *Cloeon dipterum*

The genus *Cloeon sp.* consists of one species in NA, *Cloeon dipterum*. This taxon occurs in permanent and temporal pools and other small, quiet water bodies, and therefore is rarely collected in bioassessment samples.



Dorsal view of *Cloeon sp.*  
(Photo by S.K. Burian)



Close-up of the compound gills of *Cloeon sp.*  
(Photo by S.K. Burian)

# *Callibaetis* sp.

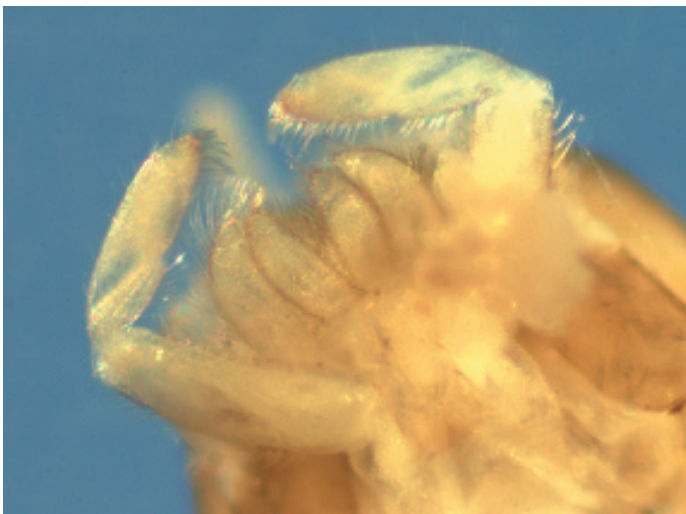
*Callibaetis* sp is primarily a mayfly of lentic habitats, but will often occur in bioassessment samples from pools or slow streams. The large, “spoon-shaped” palps are distinctive among NA Baetidae.



Dorsal view of *Callibaetis* sp.



Ventral view of the head of *Callibaetis* sp.



Ventral view of the palps of *Callibaetis* sp.

## *Apobaetis/Paracloeodes* sp.

Neither of these genera have been recorded from the states comprising region 3, but have been found in adjacent states and may eventually be encountered in the region.



Dorsal view of *Apobaetis* sp. This is a genus of large, sandy rivers. The labrum without a median notch and the long claws help to separate this genus from other baetids.



Dorsal view of *Paracloeodes* sp.



# *Pseudocloeon* sp.

The species in this genus were formerly in the genus *Labiobaetis* sp and are often listed as such in older keys. *Pseudocloeon* sp. is found throughout EPA Region 3

## **Additional References:**

**McCafferty, WP, R D Waltz. 1995. *Labiobaetis* (Ephemeroptera: Baetidae): new status, new North American species, and related new genus. Entomological News 106[1], 19-28.**

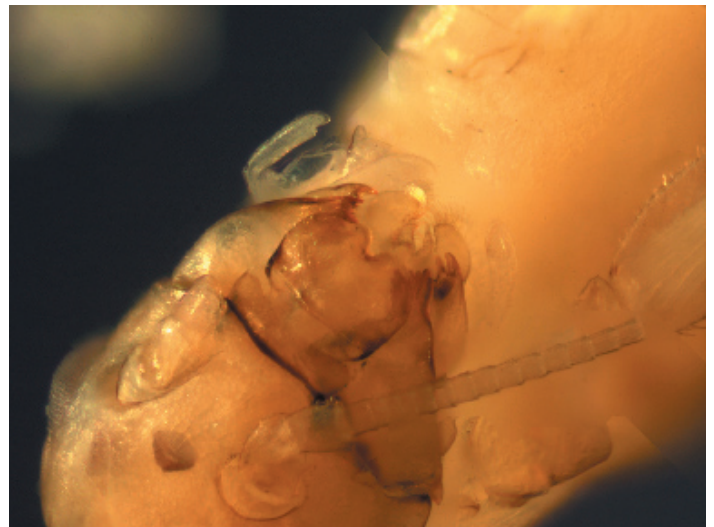
Provides characters and figures for the genus *Labiobaetis* (now *Psuedocloeon*), keys to the species of the genus *Psuedocloeon* and the description of a new species from western USA

**Morihara, DK, W P McCafferty. 1979. The *Baetis* Larvae of North America (Ephemeroptera:Baetidae). Transactions of the American Entomological Society 105, 139-221.**

Descriptions and figures for *Baetis* sp. and many taxa once included in *Baetis*, including species now placed in the genera *Acentrella*, *Acerpenna*, *Dipheter hageni*, *Plauditus*, and *Psuedocloeon*.



Dorsal view of *Pseudocloeon* sp.



Ventral view of the head of *Pseudocloeon* sp. The subapical excavation on the maxillary palp is an easily visible character to identify this genus.

# Acerpenna sp.

*Acerpenna* sp. is common throughout EPA Region 3. The genus is separated from other Baetidae by the narrowed gill on abdominal segment 7 which is dissimilar from proceeding gills, antenna inserted close together forming a raised keel, and a well developed median projection on the labial palp.

## Additional References:

Waltz, RD, W P McCafferty. New genera of Baetidae for some Nearctic species previously included in *Baetis* Leach (Ephemeroptera). *Annals of the Entomological Society of America* 80[5], 667-670. 1987.

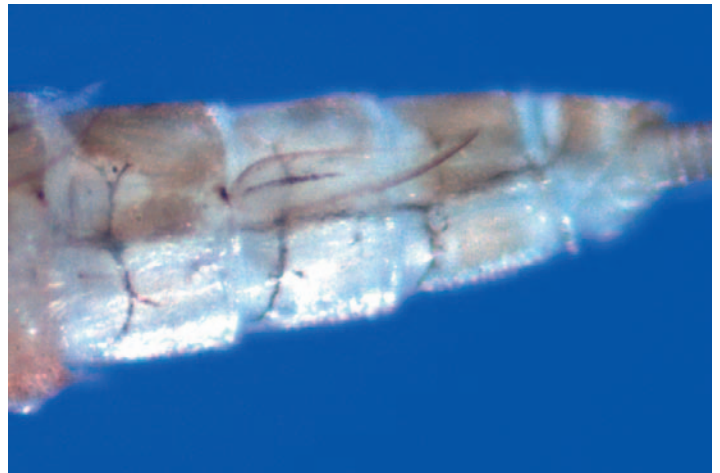
Paper which establishes the genera *Acerpenna*, *Dipheter*, and *Fallceon*, and reassigns the species in these genera from *Baetis*. Includes brief descriptions of the genera

Morihara, DK, W P McCafferty. 1979. The *Baetis* Larvae of North America (Ephemeroptera:Baetidae). *Transactions of the American Entomological Society* 105, 139-221.

Descriptions and figures for *Baetis* sp. and many taxa once included in *Baetis*, including species now placed in the genera *Acentrella*, *Acerpenna*, *Dipheter hageni*, *Plauditus*, and *Psuedocloeon*.



Dorsal view of *Acerpenna pygmaea*.



Gill 7 of *Acerpenna pygmaea*.

# *Dipheter hageni*

This genus is monotypic, with *Dipheter hageni* the sole species assigned to the genus. *Dipheter* occurs throughout EPA Region 3 and are fairly common in stream bioassessment samples. The lack of gills on abdominal segment 1 and the reduced prostheca are the easiest characters to separate this genus.

## Additional References:

Waltz, RD, W P McCafferty. New genera of Baetidae for some Nearctic species previously included in *Baetis* Leach (Ephemeroptera). *Annals of the Entomological Society of America* 80[5], 667-670. 1987.

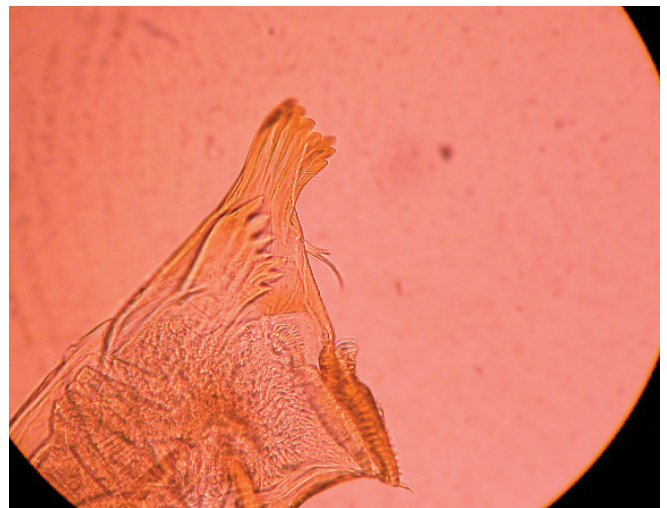
Paper which establishes the genera *Acerpenna*, *Dipheter*, and *Fallceon*, and reassigns the species in these genera from *Baetis*. Includes brief descriptions of the genera

Moriyama, DK, W P McCafferty. 1979. The *Baetis* Larvae of North America (Ephemeroptera:Baetidae). *Transactions of the American Entomological Society* 105, 139-221.

Descriptions of species and figures for *Baetis* sp. and many taxa once included in *Baetis*, including species in the genera *Acentrella*, *Acerpenna*, *Dipheter hageni*, *Plauditus*, and *Psuedocloeon*.



Dorsal and lateral views of *Dipheter hageni*.



The reduced, bifid prostheca on the right mandible of *Dipheter hageni* is distinctive for NA Baetidae, but requires slide mounting the mandible and a magnification of around 400x.

# Baetis sp.

The genus *Baetis* sp. is often one of the most common mayfly components of bioassessment samples.

## Additional References:

Morihara, DK, W P McCafferty. 1979. The *Baetis* Larvae of North America (Ephemeroptera:Baetidae). Transactions of the American Entomological Society 105, 139-221.

Descriptions and figures for *Baetis* sp. and many taxa once included in *Baetis*, including species now placed in the genera *Acentrella*, *Acerpenna*, *Dipheter hageni*, *Plauditus*, and *Psuedocloeon*.

Weirsema, N.A., C.R. Nelson, and K.F Kuehn. 2004. A New Small Minnow Mayfly (Ephemeroptera:Baetidae) from Utah, USA. Entomological News 115:139-145.

Contains the most recent key to the species of the genus *Baetis* sp.



*Baetis intercalaris*, a common species in EPA Region 3.



The labial palps of *Baetis tricaudatus*.



# *Barbaetis* sp.

*Barbaetis benfieldi*, the only species now assigned to this genus, is recorded from the SE US and is known in EPA Region 3 only from southern Virginia.

## **Additional References:**

**Waltz, RD, W P McCafferty, J H Kennedy.** *Barbaetis*: A new genus of eastern Nearctic mayflies (Ephemeroptera : Baetidae). **The Great Lakes Entomologist** 18[4], 161-165. 1985.

Description of *Barbaetis benfieldi*, the sole species in the genus.